

Extra credit #15-71 add only answers below - you must show all work! BE NEAT!

13. $\frac{x^2 + 12x + 36}{x^2 - 36}$

14. $\frac{x^2 - 14x + 49}{x^2 - 49}$

In Exercises 15-32, multiply or divide as indicated.

15. $\frac{x-2}{3x+9} \cdot \frac{2x+6}{2x-4}$ $\frac{1}{3}$

16. $\frac{6x+9}{3x-15} \cdot \frac{x-5}{4x+6}$ $\frac{1}{2}$

17. $\frac{x^2-9}{x^2} \cdot \frac{x^2-3x}{x^2+x-12}$

18. $\frac{x^2-4}{x^2-4x+4} \cdot \frac{2x-4}{x+2}$

19. $\frac{x^2-5x+6}{x^2-2x-3} \cdot \frac{x^2-1}{x^2-4}$

20. $\frac{x^2+5x+6}{x^2+x-6} \cdot \frac{x^2-9}{x^2-x-6}$

21. $\frac{x^3-8}{x^2-4} \cdot \frac{x+2}{3x}$

22. $\frac{x^2+6x+9}{x^3+27} \cdot \frac{1}{x+3}$

23. $\frac{x+1}{3} \div \frac{3x+3}{7}$ $\frac{7}{9}$

24. $\frac{x+5}{7} \div \frac{4x+20}{9}$

25. $\frac{x^2-4}{x} \div \frac{x+2}{x-2}$

26. $\frac{x^2-4}{x-2} \div \frac{x+2}{4x-8}$

27. $\frac{4x^2+10}{x-3} \div \frac{6x^2+15}{x^2-9}$

28. $\frac{x^2+x}{x^2-4} \div \frac{x^2-1}{x^2+5x+6}$

29. $\frac{x^2-25}{2x-2} \div \frac{x^2+10x+25}{x^2+4x-5}$

30. $\frac{x^2-4}{x^2+3x-10} \div \frac{x^2+5x+6}{x^2+8x+15}$

31. $\frac{x^2+x-12}{x^2+x-30} \cdot \frac{x^2+5x+6}{x^2-2x-3}$

32. $\frac{x^3-25x}{4x^2} \cdot \frac{2x^2-2}{x^2+5x}$

In Exercises 33-58, add or subtract as indicated.

33. $\frac{4x+1}{6x+5} + \frac{8x+9}{6x+5}$ 2

35. $\frac{x^2-2x}{x^2+3x} + \frac{x^2+x}{x^2+3x}$ $\frac{2x-1}{x+3}$

36. $\frac{x^2-4x}{x^2-x-6} + \frac{4x-4}{x^2-x-6}$ $\frac{x-2}{x-3}$

37. $\frac{4x-10}{x-2} - \frac{x-4}{x-2}$ 3

38. $\frac{2x+3}{3x-6} - \frac{3-x}{3x-6}$ $\frac{x}{x-2}$

39. $\frac{x^2+3x}{x^2+x-12} - \frac{x^2-12}{x^2+x-12}$ $\frac{3}{x-3}$

41. $\frac{3}{x+4} + \frac{6}{x+5}$

42. $\frac{8}{x-2} + \frac{2}{x-3}$ $\frac{10x-28}{(x-2)(x-3)}$

43. $\frac{3}{x+1} - \frac{3}{x}$ $\frac{3}{x(x+1)}$

44. $\frac{4}{x} - \frac{3}{x+3}$ $\frac{x+12}{x(x+3)}$

45. $\frac{2x}{x+2} + \frac{x+2}{x-2}$

48. $\frac{x+3}{x-3} + \frac{x-3}{x+3}$ $\frac{2x^2+18}{(x-3)(x+3)}$

47. $\frac{x+5}{x-5} + \frac{x-5}{x+5}$

50. $\frac{5}{2x+8} + \frac{7}{3x+12}$ $\frac{29}{6(x+4)}$

49. $\frac{3}{2x+4} + \frac{2}{3x+6}$

52. $\frac{3}{5x+2} + \frac{5x}{25x^2-4}$ $\frac{20x-6}{(5x-2)(5x+2)}$

53. $\frac{3x}{x^2+3x-10} - \frac{2x}{x^2+x-6}$

54. $\frac{x^2-x}{(x+5)(x-2)(x+3)}$

55. $\frac{x+3}{x^2-1} - \frac{x+2}{x-1}$

56. $\frac{x+5}{x^2-4} - \frac{x+1}{x-2}$ $\frac{-x-2x+3}{(x+2)(x-2)}$

57. $\frac{4x^2+x-6}{x^2+3x+2} - \frac{3x}{x+1} + \frac{5}{x+2}$ $\frac{x-1}{x+2}$

58. $\frac{6x^2+17x-40}{x^2+x-20} + \frac{3}{x-4} - \frac{5x}{x+5}$ $\frac{x^2+40x-25}{(x+5)(x-4)}$

55. $\frac{x+3}{x^2-1} - \frac{x+2}{x-1}$

56. $\frac{x+5}{x^2-4} - \frac{x+1}{x-2}$

57. $\frac{4x^2+x-6}{x^2+3x+2} - \frac{3x}{x+1} + \frac{5}{x+2}$

58. $\frac{6x^2+17x-40}{x^2+x-20} + \frac{3}{x-4} - \frac{5x}{x+5}$

In Exercises 59-72, simplify each complex rational expression.

59. $\frac{\frac{x-1}{3}}{\frac{x-3}{1/3}}$ $\frac{1}{3}$

60. $\frac{\frac{x-1}{4}}{\frac{x-4}{1/4}}$ $\frac{1}{4}$

61. $\frac{1+\frac{1}{x}}{3-\frac{1}{x}}$ $\frac{x+1}{3x-1}$

62. $\frac{8+\frac{1}{x}}{4-\frac{1}{x}}$ $\frac{8x+1}{4x-1}$

63. $\frac{\frac{1}{x} + \frac{1}{y}}{\frac{y+x}{xy(x+y)}}$ $\frac{1}{xy}$

64. $\frac{1-\frac{1}{x}}{\frac{x-1}{x^2y}}$ $\frac{x-1}{x^2y}$

65. $\frac{x-\frac{x}{x+3}}{\frac{x}{x+3}}$ $\frac{x}{x+3}$

66. $\frac{x-3}{x-\frac{3}{x-2}}$ $\frac{x-2}{x+1}$

67. $\frac{\frac{3}{x-2} - \frac{4}{x+2}}{\frac{7}{x^2-4}}$ $\frac{x+4}{7}$

68. $\frac{\frac{x}{x-2} + 1}{\frac{3}{x^2-4} + 1}$ $\frac{2(x+2)}{(x+1)}$

69. $\frac{\frac{1}{x+1}}{\frac{1}{x^2-2x-3} + \frac{1}{x-3}}$ $\frac{x-3}{x^2(x+1)^2}$

70. $\frac{\frac{6}{x^2+2x-15} - \frac{1}{x-3}}{\frac{1}{x+5} + 1}$ $\frac{1-x}{(x+6)(x-3)}$

71. $\frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h}$ $\frac{2x+h}{x^2(x+h)^2}$

72. $\frac{\frac{x+h}{x+h+1} - \frac{x}{x+1}}{h}$

Practice Plus

In Exercises 73-80, perform the indicated operations. Simplify the result, if possible.

73. $\left(\frac{2x+3}{x+1} \cdot \frac{x^2+4x-5}{2x^2+x-3}\right) - \frac{2}{x+2}$

74. $\frac{1}{x^2-2x-8} \div \left(\frac{1}{x-4} - \frac{1}{x+2}\right)$

75. $\left(2 - \frac{6}{x+1}\right)\left(1 + \frac{3}{x-2}\right)$

76. $\left(4 - \frac{3}{x+2}\right)\left(1 + \frac{5}{x-1}\right)$

77. $\frac{y^{-1} - (y+5)^{-1}}{5}$

78. $\frac{y^{-1} - (y+2)^{-1}}{2}$

79. $\left(\frac{1}{a^3-b^3} \cdot \frac{ac+ad-bc-bd}{1}\right) - \frac{c-d}{a^2+ab+b^2}$

80. $\frac{ab}{a^2+ab+b^2} + \left(\frac{ac-ad-bc+bd}{ac-ad+bc-bd} \div \frac{a^3-b^3}{a^3+b^3}\right)$

ANS KEY: 1

In Exercises 33-58, add or subtract as indicated.

33. $\frac{4x+1}{6x+5} + \frac{8x+9}{6x+5}$ 2

35. $\frac{x^2-2x}{x^2+3x} + \frac{x^2+x}{x^2+3x}$ $\frac{2x-1}{x+3}$

36. $\frac{x^2-4x}{x^2-x-6} + \frac{4x-4}{x^2-x-6}$ $\frac{x-2}{x-3}$

37. $\frac{4x-10}{x-2} - \frac{x-4}{x-2}$ 3

38. $\frac{2x+3}{3x-6} - \frac{3-x}{3x-6}$ $\frac{x}{x-2}$

39. $\frac{x^2+3x}{x^2+x-12} - \frac{x^2-12}{x^2+x-12}$ $\frac{3}{x-3}$

41. $\frac{3}{x+4} + \frac{6}{x+5}$

42. $\frac{8}{x-2} + \frac{2}{x-3}$ $\frac{10x-28}{(x-2)(x-3)}$

43. $\frac{3}{x+1} - \frac{3}{x}$ $\frac{3}{x(x+1)}$

44. $\frac{4}{x} - \frac{3}{x+3}$ $\frac{x+12}{x(x+3)}$

45. $\frac{2x}{x+2} + \frac{x+2}{x-2}$

48. $\frac{x+3}{x-3} + \frac{x-3}{x+3}$ $\frac{2x^2+18}{(x-3)(x+3)}$

47. $\frac{x+5}{x-5} + \frac{x-5}{x+5}$

50. $\frac{5}{2x+8} + \frac{7}{3x+12}$ $\frac{29}{6(x+4)}$

49. $\frac{3}{2x+4} + \frac{2}{3x+6}$

52. $\frac{3}{5x+2} + \frac{5x}{25x^2-4}$ $\frac{20x-6}{(5x-2)(5x+2)}$

53. $\frac{3x}{x^2+3x-10} - \frac{2x}{x^2+x-6}$

54. $\frac{x^2-x}{(x+5)(x-2)(x+3)}$

55. $\frac{x+3}{x^2-1} - \frac{x+2}{x-1}$

56. $\frac{x+5}{x^2-4} - \frac{x+1}{x-2}$ $\frac{-x-2x+3}{(x+2)(x-2)}$

57. $\frac{4x^2+x-6}{x^2+3x+2} - \frac{3x}{x+1} + \frac{5}{x+2}$ $\frac{x-1}{x+2}$

58. $\frac{6x^2+17x-40}{x^2+x-20} + \frac{3}{x-4} - \frac{5x}{x+5}$ $\frac{x^2+40x-25}{(x+5)(x-4)}$